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Interactive Simulation and Visualisation of Linear Stepping Drive

INTERACTIVE SIMULATION OF LINEAR STEPPING DRIVE

Modern coordinate drives, based on linear stepping motor, are complex systems, which consist of mechanical part (first of all, inductor and stator), controller (hardware part) and control software (command system and programs for trajectory planning) [1]. As result, imitation and simulation are becoming a very important problem. To solve this problem, the multimedia means can be used [2].

Fig.1 presents planar linear stepping drive. The command system of this drive includes motion commands, commands for setting up velocity and acceleration, commands for adjusting of drive parameters etc.

Developed multimedia program helps user to understand command system, allows to input command and to observe, how the drive processes and executes this command. Interface of interactive simulation program is shown on Fig.2.

Fig.1 –Linear Stepping Drive

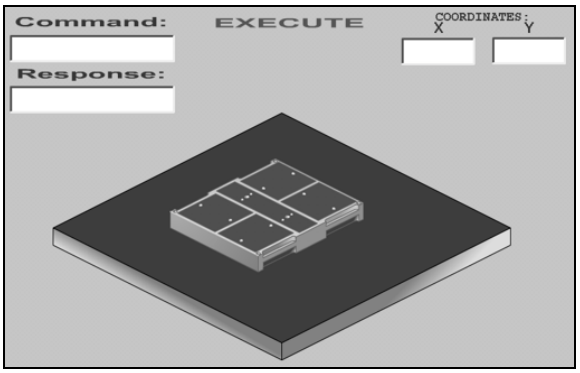

Fig.2 –Simulation Program

ALGORITHM FOR CALCULATION OF CABLE POSITION

The linear stepping drives also include the auxiliary device called by cable holder (see Fig.1). It intends for the holding of wires and air pipe as well as for the protecting of cables, preventing of contact the cable and stator etc.

To visualise the cable holder, we should know its position. To calculate position of all segments of it we use general equation of parabola (Fig.3):

$$y = Ax^2 + Bx + C$$

where *A*, *B*, *C* – unknown coefficients, which should be determined. To simplify the calculation, we fix the one of boundary points of parabola – point *A* with coordinates (0,0), therefore coefficient *C* is equal to zero (Fig.3).

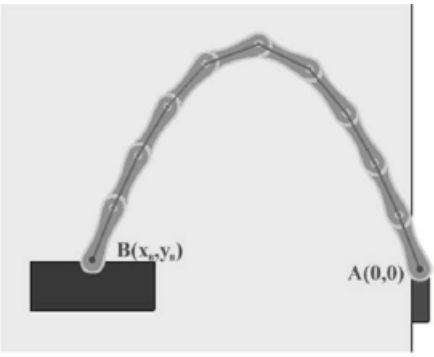

Fig.3 – Model of cable holder

To calculate the position of cable segments we use the iterative chord method, taking into account, that parabola has fixed length *L*. The result of calculation is the position of all *n* segments of cable holder.

Using the developed algorithm, the interactive module was realized, which allows to set position of inductor by Drag&Drop method, calculates the configuration of cable holder and shows its position.

CONCLUSION

Presented interactive multimedia modules can help user to observe the functioning of planar linear stepping drive, including the cable holder. Also they help to study the command system of controller using interactive tools and animation.

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